1. INTRODUCTION

1.1 Background

During the production of large-sized long-span prestressed concrete bridge girders in the prestressing plant, it has been observed that one or more fine transverse cracks often develop near the mid-third of the span before the prestressing strands are detensioned. The cracks usually extend transversely across the top flange of the girder and penetrate vertically down through the girder web, reaching toward or even into the bottom flange. As soon as the strands are detensioned, the cracks are closed and become almost invisible.

Bridge engineers have been concerned about the structural integrity and durability of the girders with such transverse cracks. To allay these concerns, the North Carolina Department of Transportation (NCDOT) had enforced a policy that if one of the cracks in the girder extends into its bottom flange, the girder would be rejected.

In a previous investigation, Zia and Caner (1993) identified the restraining force against thermal contraction during production as the primary cause for the cracking. Their research also revealed that after detensioning the cracks will heal and the concrete will virtually regain its full compressive strength if adequate supply of moisture is given to the concrete. Therefore it was recommended that additional periods of moist curing be applied to such cracked girders before they are placed in service so as to enhance the concrete healing process.

Despite these research findings, the bridge engineers continue to have concerns as to whether the cracked concrete could fully regain its tensile strength during the process of healing. In addition, the long-term performance of such girders under service load and